

*In the claims*

1-20. (Previously canceled)

21. (Currently amended) An automated method for analyzing neurite outgrowth comprising
- a) providing an array of locations comprising cells, wherein the cells possess at least a first luminescently labeled reporter molecule that reports on cell location, and at least a second luminescently labeled reporter molecule that reports on neurite outgrowth;
  - b) obtaining a nuclear image from the at least first luminescently labeled reporter molecule and a neurite image from the at least second luminescently-labeled reporter molecule;
  - c) automatically identifying cell bodies from the nuclear image;
  - d) automatically identifying neurites extending from the cell bodies ~~[from the neurite image]~~, **wherein identifying neurites extending from cell bodies comprises the steps of:**
    - I) generating a reservoir image from the neurite image; and**
    - II) identifying positive pixels in the reservoir image that are not present in the cell bodies, wherein such positive pixels belong to neurites extending from cell bodies; and**
  - e) automatically determining one or more neurite features selected from the group consisting of:
    - i) Total neurite length from all cells;**
    - ii) Total number of neurite branches from all cells;
    - iii) Number of neurites per cell;
    - iv) Number of neurites per positive neuron;
    - v) Neurite length from each cell;
    - vi) Neurite length per positive neuron;
    - vii) Neurite length per neurite;
    - viii) Number of cells that are positive for neurite outgrowth;
    - ix) Percentage of cells positive for neurite outgrowth;
    - x) Number of branches per neuron; and
    - xi) Number of branches per neurite;
- wherein the features provide a measure of neurite outgrowth from the cell bodies.

22. (Previously amended) The method of claim 21, wherein identifying cell bodies comprises the steps of:

- A) generating a kernel image from the nuclear image;
- B) performing conditional dilations of the kernel image to identify the cell body.

23. (Canceled)

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3 24. (Currently amended) The method of claim ~~22~~<sup>2</sup> [23], further comprising

(a) performing one conditional dilation of the kernel image to acquire a dilation image;

(b) determining a set of nodes from the dilation image;

(c) linking together connected nodes; and

(d) repeating steps (a)-(c) until an entire neurite length has been traced.

4 25. (Previously amended) The method of claim ~~24~~<sup>2</sup>, further comprising repeating steps (a) through (d) at multiple time points.

5 26. (Previously amended) The method of claim ~~21~~<sup>1</sup> further comprising contacting the cells with a test compound, and determining an effect of the test compound on neurite outgrowth from the cell bodies.

6 27. (Previously amended) The method of claim ~~26~~<sup>5</sup>, further comprising contacting the cells with a neurotoxin either before, after, or simultaneously with the test compound.

7 28. (Previously amended) The method of claim ~~26~~<sup>5</sup>, further comprising contacting the cells with a control compound known to stimulate neurite outgrowth, and determining whether the test compound inhibits the control compound from inducing neurite outgrowth from the cell bodies.

8 29. (Previously amended) The method of claim ~~21~~<sup>1</sup>, further comprising repeating steps b) through e) at multiple time points.

9 30. (Previously amended) The method of claim ~~21~~<sup>1</sup> wherein the first luminescently labeled reporter molecule comprises a DNA binding compound.

10 31. (Previously amended) The method of claim ~~21~~<sup>10</sup> wherein the second luminescently labeled reporter molecule is neuron-specific.

11 32. (Previously amended) The method of claim ~~31~~<sup>10</sup> wherein the neuron-specific luminescent reporter molecule comprises a molecule selected from the group consisting of neurofilament proteins,  $\beta$ III-tubulin, ciliary neurotrophic factor, and antibodies specific for neurofilament proteins.